Notice of Award

RESOURCE-RELATED RESEARCH
Department of Health and Human Services
National Institutes of Health

Federal Award Date: 07/20/2018

NATIONAL INSTITUTE OF NEUROLOGICAL DISORDERS AND STROKE

Grant Number: 5R24NS092988-04
FAIN: R24NS092988

Principal Investigator(s):
Chester Sherwood, PHD

Project Title: A National Chimpanzee Brain Resource

Ezekilova, Sylvia
Assistant Director, Sponsored Projects Admin
2121 I Street, NW
Washington, DC 200520086

Award e-mailed to: osr@gwu.edu

Period Of Performance:
Budget Period: 07/01/2018 – 06/30/2019
Project Period: 09/30/2015 – 06/30/2019

Dear Business Official:

The National Institutes of Health hereby awards a grant in the amount of $234,260 (see "Award Calculation" in Section I and "Terms and Conditions" in Section III) to GEORGE WASHINGTON UNIVERSITY in support of the above referenced project. This award is pursuant to the authority of 42 USC 241 42 CFR 52 and is subject to the requirements of this statute and regulation and of other referenced, incorporated or attached terms and conditions.

Acceptance of this award including the "Terms and Conditions" is acknowledged by the grantee when funds are drawn down or otherwise obtained from the grant payment system.

Each publication, press release, or other document about research supported by an NIH award must include an acknowledgment of NIH award support and a disclaimer such as "Research reported in this publication was supported by the National Institute Of Neurological Disorders And Stroke of the National Institutes of Health under Award Number R24NS092988. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health." Prior to issuing a press release concerning the outcome of this research, please notify the NIH awarding IC in advance to allow for coordination.

Award recipients must promote objectivity in research by establishing standards that provide a reasonable expectation that the design, conduct and reporting of research funded under NIH awards will be free from bias resulting from an Investigator's Financial Conflict of Interest (FCOI), in accordance with the 2011 revised regulation at 42 CFR Part 50 Subpart F. The Institution shall submit all FCOI reports to the NIH through the eRA Commons FCOI Module. The regulation does not apply to Phase I Small Business Innovative Research (SBIR) and Small Business Technology Transfer (STTR) awards. Consult the NIH website http://grants.nih.gov/grants/policy/coi/ for a link to the regulation and additional important information.

If you have any questions about this award, please contact the individual(s) referenced in Section IV.

Sincerely yours,

James Washington
Grants Management Officer
NATIONAL INSTITUTE OF NEUROLOGICAL DISORDERS AND STROKE

Additional information follows

SECTION I – AWARD DATA – 5R24NS092988-04

Award Calculation (U.S. Dollars)

Salaries and Wages	$39,239
Fringe Benefits	$9,849
Personnel Costs (Subtotal)	$49,088
Materials & Supplies	$12,210
Other	$1,650
Subawards/Consortium/Contractual Costs	$138,264
Federal Direct Costs	$201,212
Federal F&A Costs	$33,048
Approved Budget	$234,260
Total Amount of Federal Funds Obligated (Federal Share)	$234,260
TOTAL FEDERAL AWARD AMOUNT	$234,260
AMOUNT OF THIS ACTION (FEDERAL SHARE)	$234,260

SUMMARY TOTALS FOR ALL YEARS		
YR	**THIS AWARD**	**CUMULATIVE TOTALS**
4	$234,260	$234,260

Fiscal Information:

CFDA Name:	Extramural Research Programs in the Neurosciences and Neurological Disorders
CFDA Number:	93.853
EIN:	1530196584A1
Document Number:	RNS092988A
PMS Account Type:	P (Subaccount)
Fiscal Year:	2018

IC	CAN	2018
NS	8472430	$234,260

NIH Administrative Data:
PCC: GNADTJCN / **OC**: 414E / **Released**: eRA Commons User Name 07/18/2018
Award Processed: 07/20/2018 12:15:13 AM

SECTION II – PAYMENT/HOTLINE INFORMATION – 5R24NS092988-04

For payment and HHS Office of Inspector General Hotline information, see the NIH Home Page at http://grants.nih.gov/grants/policy/awardconditions.htm

SECTION III – TERMS AND CONDITIONS – 5R24NS092988-04

This award is based on the application submitted to, and as approved by, NIH on the above-titled project and is subject to the terms and conditions incorporated either directly or by reference in the following:

a. The grant program legislation and program regulation cited in this Notice of Award.
b. Conditions on activities and expenditure of funds in other statutory requirements, such as those included in appropriations acts.
c. 45 CFR Part 75.
d. National Policy Requirements and all other requirements described in the NIH Grants Policy Statement, including addenda in effect as of the beginning date of the budget period.
e. Federal Award Performance Goals: As required by the periodic report in the RPPR or in the final progress report when applicable.
f. This award notice, INCLUDING THE TERMS AND CONDITIONS CITED BELOW.

(See NIH Home Page at http://grants.nih.gov/grants/policy/awardconditions.htm for certain references cited above.)

Research and Development (R&D): All awards issued by the National Institutes of Health (NIH) meet the definition of "Research and Development" at 45 CFR Part§ 75.2**.** As such, auditees should identify NIH awards as part of the R&D cluster on the Schedule of Expenditures of Federal Awards (SEFA). The auditor should test NIH awards for compliance as instructed in Part V, Clusters of Programs. NIH recognizes that some awards may have another classification for purposes of indirect costs. The auditor is not required to report the disconnect (i.e., the award is classified as R&D for Federal Audit Requirement purposes but non-research for indirect cost rate purposes), unless the auditee is charging indirect costs at a rate other than the rate(s) specified in the award document(s).

An unobligated balance may be carried over into the next budget period without Grants Management Officer prior approval.

This grant is subject to Streamlined Noncompeting Award Procedures (SNAP).

This award is subject to the requirements of 2 CFR Part 25 for institutions to receive a Dun & Bradstreet Universal Numbering System (DUNS) number and maintain an active registration in the System for Award Management (SAM). Should a consortium/subaward be issued under this award, a DUNS requirement must be included. See http://grants.nih.gov/grants/policy/awardconditions.htm for the full NIH award term implementing this requirement and other additional information.

This award has been assigned the Federal Award Identification Number (FAIN) R24NS092988. Recipients must document the assigned FAIN on each consortium/subaward issued under this award.

Based on the project period start date of this project, this award is likely subject to the Transparency Act subaward and executive compensation reporting requirement of 2 CFR Part 170. There are conditions that may exclude this award; see http://grants.nih.gov/grants/policy/awardconditions.htm for additional award applicability information.

In accordance with P.L. 110-161, compliance with the NIH Public Access Policy is now mandatory. For more information, see NOT-OD-08-033 and the Public Access website: http://publicaccess.nih.gov/.

This award represents the final year of the competitive segment for this grant. See the NIH Grants Policy Statement Section 8.6 Closeout for complete closeout requirements at: http://grants.nih.gov/grants/policy/policy.htm#gps.

A final expenditure Federal Financial Report (FFR) (SF 425) must be submitted through the eRA Commons (Commons) within 120 days of the period of performance end date; see the NIH Grants Policy Statement Section 8.6.1 Financial Reports, http://grants.nih.gov/grants/policy/policy.htm#gps, for additional information on this submission requirement. The final FFR must indicate the exact balance of unobligated funds and may not reflect any unliquidated obligations. There must be no discrepancies between the final FFR expenditure data and the Payment Management System's (PMS) quarterly cash transaction data. A final quarterly federal cash transaction report is not required for awards in PMS B subaccounts (i.e., awards to foreign entities and to Federal agencies). NIH will close the awards using the last recorded cash drawdown level in PMS for awards that do not require a final FFR on expenditures or quarterly federal cash transaction reporting. It is important to note that for financial closeout, if a grantee fails to submit a required final expenditure FFR, NIH will close the grant using the last recorded cash drawdown level. If the grantee submits a final expenditure FFR but does not reconcile any discrepancies between expenditures reported on the final expenditure FFR and the last cash report to PMS, NIH will close the award at the lower amount. This could be considered a debt or result in disallowed costs.

A Final Invention Statement and Certification form (HHS 568), (not applicable to training, construction, conference or cancer education grants) must be submitted within 120 days of the expiration date. The HHS 568 form may be downloaded at: http://grants.nih.gov/grants/forms.htm. This paragraph does not apply to Training grants, Fellowships, and certain other programs—i.e., activity codes C06, D42, D43, D71, DP7, G07, G08, G11, K12, K16, K30, P09, P40, P41, P51, R13, R25, R28, R30, R90, RL5, RL9, S10, S14, S15, U13, U14, U41, U42, U45, UC6, UC7, UR2, X01, X02.

Unless an application for competitive renewal is submitted, a Final Research Performance Progress Report (Final RPPR) must also be submitted within 120 days of the period of performance end date. If a competitive renewal application is submitted prior to that date, then an Interim RPPR must be submitted by that date as well. Instructions for preparing an Interim or Final RPPR are at: https://grants.nih.gov/grants/rppr/rppr_instruction_guide.pdf. Any other specific requirements set forth in the terms and conditions of the award must also be addressed in the Interim or Final RPPR. *Note that data reported within Section I of the Interim and Final RPPR forms will be made public and should be written for a lay person audience*.

NIH strongly encourages electronic submission of the final invention statement through the Closeout feature in the Commons, but will accept an email or hard copy submission as indicated below.

Email: The final invention statement may be e-mailed as PDF attachments to: NIHCloseoutCenter@mail.nih.gov.

Hard copy: Paper submissions of the final invention statement may be faxed to the NIH Division of Central Grants Processing, Grants Closeout Center, at 301-480-2304, or mailed to:

National Institutes of Health
Office of Extramural Research
Division of Central Grants Processing
Grants Closeout Center
6705 Rockledge Drive
Suite 5016, MSC 7986
Bethesda, MD 20892-7986 (for regular or U.S. Postal Service Express mail)
Bethesda, MD 20817 (for other courier/express deliveries only)

NOTE: If this is the final year of a competitive segment due to the transfer of the grant to another institution, then a Final RPPR is not required. However, a final expenditure FFR is required and should be submitted electronically as noted above. If not already submitted, the Final Invention Statement is required and should be sent directly to the assigned Grants Management Specialist.

In accordance with the regulatory requirements provided at 45 CFR 75.113 and Appendix XII to 45 CFR Part 75, recipients that have currently active Federal grants, cooperative agreements, and procurement contracts with cumulative total value greater than $10,000,000 must report and maintain information in the System for Award Management (SAM) about civil, criminal, and administrative proceedings in connection with the award or performance of a Federal award that reached final disposition within the most recent five-year period. The recipient must also make semiannual disclosures regarding such proceedings. Proceedings information will be made publicly available in the designated integrity and performance system (currently the Federal Awardee Performance and Integrity Information System (FAPIIS)). Full reporting requirements and procedures are found in Appendix XII to 45 CFR Part 75. This term does not apply to NIH fellowships.

Treatment of Program Income:
Additional Costs

SECTION IV – NS Special Terms and Conditions – 5R24NS092988-04

Clinical Trial Indicator: No
This award does not support any NIH-defined Clinical Trials. See the NIH Grants Policy Statement Section 1.2 for NIH definition of Clinical Trial.

This non-competing award has been made at the full committed level- the level indicated on the most recent Notice of Grant Award for FY 2018 award.

Where consortia are included, they are to be established and administered as described in the NIH Grants Policy Statement (NIH GPS). The referenced section of the NIH Grants Policy Statement is available at: http://grants.nih.gov/grants/policy/nihgps/index.htm

The grantee is required to follow the model organism sharing plan included in the grant application and may not implement any changes in the plan without NINDS staff approval.

The funds in this award shall not be used to pay the salary of an individual at a rate in excess of Executive Level II ($189,600) per year effective January 7, 2018. See NIH Guide Notice: NOT-OD-18-137 https://grants.nih.gov/grants/guide/notice-files/NOT-OD-18-137.html

To register to use the Commons go to https://commons.era.nih.gov/commons/. Questions regarding the Commons should be addressed to Commons Support at 1-866-504-9552 or commons@od.nih.gov.

Other documents applicable to this grant should be faxed to (301) 451-5635 or mailed to:

Grants Management Branch
National Institutes of Neurological Disorders and Stroke
6001 Executive Boulevard, Suite 3290, MSC 9537
Rockville, MD 20852 (Express Mail)
Bethesda, MD 20892-9537 (Regular Mail)

For additional information, you may access the NIH home page at http://www.nih.gov/ and the NINDS Home Page at http://www.ninds.nih.gov.

STAFF CONTACTS

The Grants Management Specialist is responsible for the negotiation, award and administration of this project and for interpretation of Grants Administration policies and provisions. The Program Official is responsible for the scientific, programmatic and technical aspects of this project. These individuals work together in overall project administration. Prior approval requests (signed by an Authorized Organizational Representative) should be submitted in writing to the Grants Management Specialist. Requests may be made via e-mail.

Grants Management Specialist: Melissa R Copeland
Email: mh601f@nih.gov **Phone**: 301-496-7460 **Fax**: 301-451-5635

Program Official: James W Gnadt
Email: gnadtjw@ninds.nih.gov **Phone**: 301-496-9964

SPREADSHEET SUMMARY
GRANT NUMBER: 5R24NS092988-04

INSTITUTION: GEORGE WASHINGTON UNIVERSITY

Budget	Year 4
Salaries and Wages	$39,239
Fringe Benefits	$9,849
Personnel Costs (Subtotal)	$49,088
Materials & Supplies	$12,210
Other	$1,650
Subawards/Consortium/Contractual Costs	$138,264
TOTAL FEDERAL DC	$201,212
TOTAL FEDERAL F&A	$33,048
TOTAL COST	$234,260

Facilities and Administrative Costs	Year 4
F&A Cost Rate 1	52.5%
F&A Cost Base 1	$62,948
F&A Costs 1	$33,048

A. OVERALL COVER PAGE

Project Title: A National Chimpanzee Brain Resource	
Grant Number: 5R24NS092988-04	**Project/Grant Period:** 09/30/2015 - 06/30/2019
Reporting Period: 07/01/2017 - 06/30/2018	**Requested Budget Period:** 07/01/2018 - 06/30/2019
Report Term Frequency: Annual	**Date Submitted:** 05/24/2018
Program Director/Principal Investigator Information: CHESTER SHERWOOD , BA MA PHD **Phone number:** 202-994-6346 **Email:** sherwood@gwu.edu	**Recipient Organization:** GEORGE WASHINGTON UNIVERSITY GEORGE WASHINGTON UNIVERSITY OFFICE OF THE VICE PRESIDENT FOR RESEARCH 2121 EYE ST NW, STE 601 WASHINGTON, DC 200520001 **DUNS:** 043990498 **EIN:** 1530196584A1 **RECIPIENT ID:**
Change of Contact PD/PI: No	
Administrative Official: SYLVIA EZEKILOVA 2121 I Street, NW, Suite 601 Washington, DC 20052 **Phone number:** 2029946255 **Email:** osr@email.gwu.edu	**Signing Official:** SYLVIA EZEKILOVA 2121 I Street, NW, Suite 601 Washington, DC 20052 **Phone number:** 2029946255 **Email:** osr@email.gwu.edu
Human Subjects: No	**Vertebrate Animals:** No
hESC: No	**Inventions/Patents:** No

B. OVERALL ACCOMPLISHMENTS

B.1 WHAT ARE THE MAJOR GOALS OF THE PROJECT?

This project will provide the infrastructure, expertise, and tools for a National Chimpanzee Brain Resource for neuroscience research. Chimpanzees are the closest living relatives of humans, sharing more than 98% DNA similarity. As a result, chimpanzees possess a number of behavioral and cognitive abilities that distinguish them from other nonhuman species often used in behavioral and biomedical research such as mice, rats, and monkeys. Such abilities include basic symbolic communication, self-recognition, third party reconciliation and consolation, tool use, imitation learning, and empathy. Thus, chimpanzees are a unique species for understanding recently evolved cognitive phenotypes, some of which are abnormally manifest in neurological and neurodevelopmental disorders in humans. However, the chimpanzee resources managed by the NIH have been underutilized, particularly in the context of neuroscience. There is a broad community of researchers who would benefit from a National Chimpanzee Brain Resource. As part of this project we will create an infrastructure that will: (1) manage communication with National Primate Research Centers and the National Chimpanzee Sanctuary (Chimp Haven) to coordinate brain collection and shipping; (2) acquire high resolution structural MRI and diffusion tensor imaging of postmortem fixed brains; (3) provide open access to and a catalog of T1-weighted structural MRI and resting state fMRI scans of a sample of chimpanzee brains; (4) develop an online, minable database so that scientists can query the collection of MRIs and tissue samples and submit requests. We will also develop tools that will include: (1) MRI-based template of the chimpanzee brain with probabilistic maps of cortical regions determined by cytoarchitectonic methods; (2) an online searchable database of grey and white matter volumes, as well as cortical thickness, of key brains regions of interest, including region-of-interest maps; (3) a database of chimpanzee brain connectivity that will be developed from diffusion tensor images; (4) a detailed chimpanzee brain atlas created from histological sections; (5) coordination with the Allen Institute for Brain Science to begin creating a chimpanzee gene-expression map. Furthermore, we will obtain a behavioral database from chimpanzees to enable the investigation of brain anatomy-behavior-genomic associations. Data on motor skill (tool use, grasping skill), laterality, social and physical cognition (gaze following, initiating and comprehension of social communicative skills, spatial memory, object permanence) will continue to be obtained and data on social behavior (i.e., grooming, social play) and temperament will also be collected for each individual.

Milestones: Evaluation of progress of the project will be determined in reference to objective quantitative milestones. Measures will be the usage of the chimpanzee brain resource as indicated by the number of tissue and MRI scan requests, MRI and behavioral database queries and downloads, and visits to the NCBR web-based portal. Currently, we receive approximately 5 tissue requests per year and the MRI data have been used almost exclusively by our own research group. We anticipate that increased advertising, the launch of the NCBR website, the availability of a comprehensive set of atlasing tools, and more integration of chimpanzee data with other resources such as those available through the Allen Institute for Brain Science, will result in increased requests.

We propose the following annual milestones for the project –

Year 1 Milestones:
Milestone 1: 10 requests from investigators for use of brain tissue or MRI scan data;
Milestone 2: Create an operational web portal;
Milestone 3: Beta test the website with the steering committee
Milestone 4: Initial phase of listing availability of MRI and behavioral database upon request via the website;
Milestone 5: Two meetings or conference calls with the steering committee to discuss progress and future plans for the grant.

Year 2 Milestones:
Milestone 6: 15 requests from investigators for use of brain tissue or MRI scan data;
Milestone 7: Advertisement and dissemination of our resource, which should lead to at least 1,000 unique website portal visits;
Milestone 8: More MRI and behavioral data added to the website;
Milestone 9: MRI template and atlas added to website
Milestone 10: DTI-based connectivity resources added to the website;
Milestone 11: Two meetings or conference calls with the steering committee to discuss progress and future plans for the grant.

Year 3 Milestones:
Milestone 12: 20 requests from investigators for use of brain tissue or MRI scan data;
Milestone 13: 5,000 cumulative unique website portal visits;
Milestone 14: Addition of series of histological sections with anatomical labeling
Milestone 15: Addition of probabilistic maps of cortical regions to the MRI template coordinate atlas.
Milestone 16: Two meetings or conference calls with the steering committee to discuss progress and future plans for the grant, including plans towards renewal.

Year 4 Milestones:
Milestone 17: 30 requests from investigators for use of brain tissue or MRI scan data;
Milestone 18: 8,000 cumulative unique website portal visits;
Milestone 19: Addition of gene expression data to the MRI template atlas.
Milestone 20: Two meetings or conference calls with the steering committee to discuss progress and future plans for the grant.

B.1.a Have the major goals changed since the initial competing award or previous report?

No

B.2 WHAT WAS ACCOMPLISHED UNDER THESE GOALS?

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B.3 COMPETITIVE REVISIONS/ADMINISTRATIVE SUPPLEMENTS

For this reporting period, is there one or more Revision/Supplement associated with this award for which reporting is required?

No

B.4 WHAT OPPORTUNITIES FOR TRAINING AND PROFESSIONAL DEVELOPMENT HAS THE PROJECT PROVIDED?

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B.5 HOW HAVE THE RESULTS BEEN DISSEMINATED TO COMMUNITIES OF INTEREST?

We created and launched the National Chimpanzee Brain Resource website (www.chimpanzeebrain.org) on April 8, 2016. Since the time of the website launch, it has received 23,567 pageviews. We had a booth at the Society for Neuroscience conference in 2016 to disseminate information about the resource. In addition, the NCBR was featured at a booth at the USA Science and Engineering Festival 2018. At these events, as well as recent conferences of the American Society of Primatologists and American Association of Physical Anthropologists, we have distributed branded magnets and pens, and signed up new potential users for the NCBR mailing list. We have also spread information about NCBR updates via social media.

B.6 WHAT DO YOU PLAN TO DO DURING THE NEXT REPORTING PERIOD TO ACCOMPLISH THE GOALS?

MRI template will be added to website in development currently in collaboration with the lab of Dr. Armin Raznahan (NIMH).

DTI-based connectivity resources will be added to the website to be coordinated by Dr. Marco Catani.

The digital chimpanzee brain histology collection will be added to the NCBR website.

We will add probabilistic maps of cortical regions obtained from a set of 10 histological section in the MRI template coordinate space.

We will continue to hold meetings with PIs and the steering committee.

B.2 What was accomplished under these goals?

We have accomplished all the Milestone goals outlined for Year 1 and most for Years 2-4.

Progress on Remaining Year 2 Milestones

Milestone 9: The creation of an MRI template atlas is in progress in partnership with the laboratory of Dr. Armin Raznahan, NIH.

Milestone 10: The creation of a tractography atlas is in progress in partnership with the laboratory of Dr. Marco Catani, King's College London.

Year 3 Milestones

Milestone 12: Since launching the NCBR, we have received 62 requests from investigators for use of brain tissue or MRI scan data; 13 requests involved fresh frozen brain tissue, 16 requests involved fixed tissue, 15 were for DTI data and 29 were for MRI data. We have fulfilled 58 of these requests to date. A total of 4 requests went unfulfilled because the investigator did not follow up after being contacted for more details about their proposed usage.

Milestone 13: We created and launched the National Chimpanzee Brain Resource website (www.chimpanzeebrain.org) on April 8, 2016. Since the time of the website launch, it has received 23,567 pageviews. We had a booth at the Society for Neuroscience conference in 2016 to disseminate information about the resource. In addition, the NCBR was featured at a booth at the USA Science and Engineering Festival 2018. At these events, as well as recent conferences of the American Society of Primatologists and American Association of Physical Anthropologists, we have distributed branded magnets and pens, and signed up new potential users for the NCBR mailing list. We have also spread information about NCBR updates via social media.

Milestone 14: We have equipped the National Museum of Health and Medicine with an upgrade to their MBF Bioscience image montage acquisition system. Using this new instrument, we are in the process of acquiring high-resolution scans of a Nissl and myelin stain series from a celloidin-embedded chimpanzee brain in their collection. The digital histology database will be accessible to the public for viewing using MBF Biolucida Cloud embedded in the NCBR website. This is possible thanks to a partnership that was established with the Journal of Comparative Neurology / Wiley Publishers. At present, we have acquired 12 Nissl stained and 5 myelin stained images. Image montaging will continue over the next year. We have also requested contributions of other chimpanzee brain histology sections from other labs to add to the NCBR's public "digital chimpanzee brain histology collection". Prof. Jon Kaas has contributed several series of immunostained sections which are in the process of being scanned and added to the Biolucida cloud.

Milestone 15: The creation of probabilistic maps of cortical regions to add to the MRI template coordinate atlas is in progress.

Milestone 16: We have held regular meetings with project personnel during this reporting period. In addition, steering committee members have been contacted via email and phone to discuss progress.

Year 4 Milestones

Milestone 17: 62 requests from investigators for use of brain tissue or MRI scan data;

Milestone 18: 23,567 cumulative unique website portal visits;

Milestone 19: We are ahead of schedule in completing the Year 4 milestone of providing a public resource of gene expression from the chimpanzee brain. In partnership, with Dr. Nenad Sestan's lab we have deep sequenced mRNAs and small noncoding RNAs from 16 brain regions of chimpanzees to compare with rhesus macaques and the complementary human BrainSpan dataset. Transcriptional profiles came from tissue samples representing hippocampus, amygdala, striatum, mediodorsal nucleus of thalamus, cerebellar cortex, and 11 areas of the neocortex from five adult chimpanzees. The resulting dataset was published in Science (Sousa et al., 2017) and is available through the NCBR website and NCBI BioProject 236446.

Other accomplishments -

(Prefrontal cortex.) We recently collaborated on a study of prefrontal cortex (PFC) size in chimpanzees, with comparisons to humans and macaques (Donahue et al., 2018, PNAS, PMID: 29739891), with the goal of addressing one of the most controversial current issues in primate neuroanatomy: the amount of prefrontal cortex in apes compared to humans and monkeys. The problem has been the lack of well-defined prefrontal borders in chimpanzees and other apes. In lieu of such a border, researchers have resorted to proxies, including total frontal lobe size and amount of cortex anterior to the genu of the corpus callosum. In some cases, researchers have concluded that there was no evolutionary enlargement of human prefrontal cortex compared to apes. We defined prefrontal cortex on architectonic grounds, first identifying widely agreed-upon prefrontal borders in myeloarchitecture in humans and macaques derived from MRI, as in the Human Connectome Project, and then identifying homologous borders in chimpanzees, using our sample of 29 chimpanzees processed though the Human Connectome Project pipeline (and included in the NCBR). We found that in both absolute and relative terms, human PFCis larger than that of chimpanzees. Human PFC gray matter is about 4.5 times as large as chimpanzee PFC gray matter. Relative to brain size, which is much larger in humans, human PFC gray matter occupies about 24% more of the cortical mantle than in chimpanzees. The human-chimpanzee disparities are even more pronounced for prefrontal white matter. Moreover, gene-based estimates of prefrontal volume are highly inaccurate. All data from this study are freely available from the BALSA database(https://balsa.wustl.edu/) at https://balsa.wustl.edu/study/show/zlVX.

Unpublished

In preparation for this reporting period, we sent an email survey to all users that have received tissue or data from the NCBR to request information on publications, new grant proposals, and funded grants that have been supported by the NCBR resource. Below is a compilation of what has been reported.

Publications that have utilized NCBR resources (new since last reporting period)

Quantitative assessment of prefrontal cortex in humans relative to nonhuman primates.
Donahue CJ, Glasser MF, Preuss TM, Rilling JK, Van Essen DC.
Proc Natl Acad Sci U S A. 2018 May 8. pii: 201721653. doi: 10.1073/pnas.1721653115. [Epub ahead of print]
PMID: 29739891

A neuroanatomical predictor of mirror self-recognition in chimpanzees.
Hecht EE, Mahovetz LM, Preuss TM, Hopkins WD.
Soc Cogn Affect Neurosci. 2017 Jan 1;12(1):37-48. doi: 10.1093/scan/nsw159.

PMID: 27803287

Midsagittal Brain Variation among Non-Human Primates: Insights into Evolutionary Expansion of the Human Precuneus.
Pereira-Pedro AS, Rilling JK, Chen X, Preuss TM, Bruner E.
Brain Behav Evol. 2017;90(3):255-263. doi: 10.1159/000481085. Epub 2017 Oct 25.
PMID: 29065406

Identification of in vivo Sulci on the External Surface of Eight Adult Chimpanzee Brains: Implications for Interpreting Early Hominin Endocasts.
Falk D, Zollikofer CPE, Ponce de León M, Semendeferi K, Alatorre Warren JL, Hopkins WD.
Brain Behav Evol. 2018;91(1):45-58. doi: 10.1159/000487248. Epub 2018 Mar 13.
PMID: 29533941

Early Socioemotional Intervention Mediates Long-Term Effects of Atypical Rearing on Structural Covariation in Gray Matter in Adult Chimpanzees.
Bard KA, Hopkins WD.
Psychol Sci. 2018 Apr;29(4):594-603. doi: 10.1177/0956797617740685. Epub 2018 Jan 30.
PMID: 29381427

Changes in Frontoparietotemporal Connectivity following Do-As-I-Do Imitation Training in Chimpanzees (Pan troglodytes).
Pope SM, Taglialatela JP, Skiba SA, Hopkins WD.
J Cogn Neurosci. 2018 Mar;30(3):421-431. doi: 10.1162/jocn_a_01217. Epub 2017 Dec 6.
PMID: 29211652

Human torque is not present in chimpanzee brain.
Li X, Crow TJ, Hopkins WD, Gong Q, Roberts N.
Neuroimage. 2018 Jan 15;165:285-293. doi: 10.1016/j.neuroimage.2017.10.017. Epub 2017 Oct 12.
PMID: 29031530

Aged chimpanzees exhibit pathologic hallmarks of Alzheimer's disease.
Edler MK, Sherwood CC, Meindl RS, Hopkins WD, Ely JJ, Erwin JM, Mufson EJ, Hof PR, Raghanti MA.
Neurobiol Aging. 2017 Nov;59:107-120. doi: 10.1016/j.neurobiolaging.2017.07.006. Epub 2017 Aug 1.
PMID: 28888720

Genetic Factors and Orofacial Motor Learning Selectively Influence Variability in Central Sulcus Morphology in Chimpanzees (Pan troglodytes).
Hopkins WD, Coulon O, Meguerditchian A, Autrey M, Davidek K, Mahovetz L, Pope S, Mareno MC, Schapiro SJ.
J Neurosci. 2017 May 31;37(22):5475-5483. doi: 10.1523/JNEUROSCI.2641-16.2017. Epub 2017 May 4.
PMID: 28473646

Species Differences in the Organization of the Ventral Cochlear Nucleus.
Baizer JS, Wong KM, Salvi RJ, Manohar S, Sherwood CC, Hof PR, Baker JF, Witelson SF.
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PMID: 29236365

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Endocast morphology of Homo naledi from the Dinaledi Chamber, South Africa
Ralph L. Holloway, Shawn D. Hurst, Heather M. Garvin, P. Thomas Schoenemann, William B. Vanti, Lee R. Berger, John Hawks
Proceedings of the National Academy of Sciences May 2018, 201720842; DOI: 10.1073/pnas.1720842115

Bauernfeind AL, Babbitt CC. The predictive nature of transcript expression levels on protein abundance in adult human brain. BMC Genomics: 18: 322.

Unpublished

Unpublished

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Sousa, A.A.M., Zhu, Y., Raghanti, M.A., Kitchen, R.R., Onorati, M., Tebbenkamp, A.T.N., Stutz, B., Meyer, K.A., Li, M., Kawasawa, Y.I., Liu, F., Perez, R.G., Mele, M., Carvalho, T., Skarica, M., Gulden, F.O., Pletikos, M., Shibata, A., Stephenson, A.R., Edler, M.K., Ely, J.J., Elsworth, J.D., Horvath, T.L., Hof, P.R., Hyde, T.M., Kleinman, J.E., Weinberger, D.R., Reimers, M., Lifton, R.P., Mane, S.M., Noonan, J.P.,

State, M.W., Lein, E.S., Knowles, J.A., Marques-Bonet, T., Sherwood, C.C., Gerstein, M.B., Šestan, N. (2017) Molecular and cellular reorganization of neural circuits in the human lineage. Science 358, 1027-1032.

Edler, M.K., Sherwood, C.C., Meindl, R.S., Hopkins, W.D., Ely, J.J., Erwin, J.M., Mufson, E.J., Hof, P.R., Raghanti, M.A. (2017) Aged chimpanzees exhibit pathologic hallmarks of Alzheimer's disease. Neurobiology of Aging 59, 107-120.

Stephenson, A.R., Edler, M.E., Erwin, J.M., Jacobs, B., Hopkins, W.D., Hof, P.R., Sherwood, C.C., Raghanti, M.A. (2017) Cholinergic innervation of the basal ganglia among human and nonhuman primates. Journal of Comparative Neurology 525, 319-332.

Presentation that have utilized NCBR resources (new since last reporting period)

The endocast of LES1, Homo naledi
Shawn D. Hurst, Ralph L. Holloway, Heather M. Garvin, William B. Vanti, Lee R. Berger, John Hawks
87th Annual Meeting of the American Association of Physical Anthropologists, April 11-14, 2018 Austin, TX

Soojin Yi

1. Department of Ecology and Evolutionary Biology, University of California Irvine, 12/05/17. "DNA Methylation, Genome Evolution, and Human Brains". Irvine, CA.
2. 2017 Susumu Ohno Memorial Lecture at City of Hope, 12/04/2017, "Susumu Ohno's Legacy in Evolutionary Epigenomics" Diabetes and Metabolism Research Institute at City of Hope, Duarte, CA.
3. Department of Genetics, University of Georgia, 08/30/2017, Athens, GA.
4. Annual Meeting for the Society for Molecular Biology and Evolution, Austin, TX. July 2-6, 2017
5. Institute of Genomic Biology Seminar, University of Illinois, Urbana Champaign. Urbana, IL. 02/28/2017
6. Darwin Day Scientific Lecture, University of North Georgia, "DNA Methylation and Genome Evolution in Animals". Feb. 3, 2017. Dahlonega, GA.
7. Darwin Day Community Lecture, University of North Georgia, "Human Evolutionary History in Our DNA". Feb. 2, 2017. Dahlonega, GA.

Bauernfeind AL, Ely JJ, Raghanti MA, Hopkins WD, Hof PR, Sherwood CC, Babbitt CC. Evolution of regional gene expression in the cerebellum of primates. American Association of Physical Anthropology, Austin, TX.

Babbitt CC, Ely JJ, Raghanti MA, Hopkins WD, Hof PR, Sherwood CC, Bauernfeind AL. Tempo and mode of gene expression evolution in the brain across the primate tree. American Association of Physical Anthropology, Austin, TX.

Zintel TM, Ely JJ, Raghanti MA, Hopkins WD, Hof PR, Sherwood CC, Kamilar J, Bauernfeind AL, Babbitt CC. Evolution of regional gene expression in the cerebellum of primates. American Association of Physical Anthropology, Austin, TX.

Society for Neuroscience Annual Meeting; Washington DC, November 2017
Alterations of neuron-subtype-specific non-coding regulatory elements in the course of evolution of the primate prefrontal cortex
Kozlenkov A, Vermunt M, Apontes P, Sherwood C, Hurd YL, Byne W, Creyghton M, and Dracheva S

NIDA Genetics and Epigenetics Cross-cutting Research Meeting, Washington DC, January 2018
Regulatory signatures in primate neurons at cell type resolution
Kozlenkov A, Vermunt M, Apontes P, Li J, Sherwood C, Hurd YL, Mukamel EA, Creyghton M, and Dracheva S

Icahn School of Medicine at Mount Sinai; Department of Psychiatry Seminar; March 2018
Evolution of regulatory signatures in cortical primate neurons
Kozlenkov A

Raghanti, M.A. (2017) Dopamine innervation in the cortico-basal ganglia pathway of humans and nonhuman primates and its relevance to social cognition. 5th Congress of the Asian College of Neuropsychopharmacology. Bali, Indonesia. Invited paper.

Raghanti, M.A. (2018) At the beginning: A neurochemical hypothesis for human origins. Fordon Research Conference: Neurobiology of Cogition. Newry, Maine. June 22-27.

Unpublished

Unpublished

Design and application of a chimpanzee template for SPM/CAT
Sam Vickery
OHBM 2018

New grant proposals

Pending Support

Unpublished

Katherine Bryant - Private Source to work on a project that uses NCBR materials Private Source. Awarded.

Rogier Mars – Private Source Awarded.

B.4 What opportunities for training and professional development has the project provided?

The Senior Research Associate funded for 50% salary on the grant has received professional development through participation in regular lab meetings, honed management skills through coordinating the shipping and receipt of brains from donating institutions, and gained technical experience though collating data on individual chimpanzees for incorporation into the database.

Trainees
Ishana Raghuram (undergraduate intern, UC Berkeley)
Christina Rogers (PhD student, Emory University)
Shweta Sahu (undergraduate intern, Emory University)
Ethan Seigel (undergraduate intern, Emory University)
Vikrant Nallaparaju (undergraduate intern, Emory University)
Timothy Lee (undergraduate intern, Emory University)
Katherine Bryant (Postdoctoral scientist, Emory University)
Amy Ross (Postdoctoral scientist, Georgia State University)
Alexey Kozlenkov (Postdoctoral scientist, Ichan School of Medicine at Mount Sinai)
Pasha Apontes (Postdoctoral scientist, James J Peters VA Medical Center)
Marit Vermunt (Postdoctoral scientist, University of Pennsylvania)
Violetta Rucinski (undergraduate intern, Ichan School of Medicine at Mount Sinai)
Melissa Edler (PhD student, Kent State University)
Emily Munger, (PhD student, Kent State University)
Danielle Jones (Masters student, Kent State University)
Stacy Deraway (Masters student, Kent State University)
Matthew Hudnall (Masters student, Kent State University)
James Moore (undergraduate intern, Kent State University)
Demetra Rahmon (undergraduate student and McNair Scholar, Kent State University)
Colin Shew (PhD student, UC Davis)
Noriyoshi Usui (Postdoctoral scientist, UT Southwestern; now Assistant Professor at Osaka University)
Stefano Berto (Postdoctoral scientist, UT Southwestern)
Pablo Lemercier (undergraduate intern, Aix Marseille Universite)
Sam Vickery (Masters student, Universität Düsseldorf)
Niels Reuter (PhD student, Universität Düsseldorf)
Ella Dublin (undergraduate intern, Drake University)
Michael Conte (graduate medical student, Des Moines University)
Alexandra DeCasien (PhD student, New York University)
Brian Schilder (PhD student, The George Washington University)
Laura Reyes (PhD student, The George Washington University)
Andrey Verendeev (Postdoctoral scientist, The George Washington University)
Nicky Staes (Postdoctoral scientist, The George Washington University)
Aida Gomez-Robles (Postdoctoral scientist, The George Washington University)
Habon Issa (undergraduate intern, The George Washington University)
Madeline Rosenstein (undergraduate intern, The George Washington University)
Sophia Diggs-Galligan (high school intern, The George Washington University)
Sheel Singh (undergraduate intern, The George Washington University)
Sarah Miller (undergraduate intern, Dartmouth University)
Francesca Cavallo (Masters student, University of Turin)
Chiara La Rosa (PhD student, University of Turin)
Alex DeCasien (PhD student, New York University)
Francois Chouinard-Decorte (Postdoctoral scientist, McGill University)
Anastasia Osoianu (Masters student, Institut Pasteur)
Katja Heuer (PhD student, Institut Pasteur)
Isabel Mendizabal (Postdoctoral scientist, Georgia Tech)

Iksoo Huh (Postdoctoral scientist, Georgia Tech)
Devika Singh (PhD student, Georgia Tech)

C. OVERALL PRODUCTS

C.1 PUBLICATIONS

Are there publications or manuscripts accepted for publication in a journal or other publication (e.g., book, one-time publication, monograph) during the reporting period resulting directly from this award?

Yes

Publications Reported for this Reporting Period

Public Access Compliance	Citation
Complete	Duka T, Collins Z, Anderson SM, Raghanti MA, Ely JJ, Hof PR, Wildman DE, Goodman M, Grossman LI, Sherwood CC. Divergent lactate dehydrogenase isoenzyme profile in cellular compartments of primate forebrain structures. Molecular and cellular neurosciences. 2017 July;82:137-142. PubMed PMID: 28461219; PubMed Central PMCID: PMC5531073.
Complete	Baizer JS, Wong KM, Salvi RJ, Manohar S, Sherwood CC, Hof PR, Baker JF, Witelson SF. Species Differences in the Organization of the Ventral Cochlear Nucleus. Anatomical record (Hoboken, N.J. : 2007). 2018 May;301(5):862-886. PubMed PMID: 29236365; PubMed Central PMCID: PMC5902649.

Non-compliant Publications Previously Reported for this Project

Public Access Compliance	Citation
Non-Compliant	Interhemispheric gene expression differences in the cerebral cortex of humans and macaque monkeys. Brain structure & function.

C.2 WEBSITE(S) OR OTHER INTERNET SITE(S)

Category	Explanation
Data or Databases	www.chimpanzeebrain.org - National Chimpanzee Brain Resource

C.3 TECHNOLOGIES OR TECHNIQUES

NOTHING TO REPORT

C.4 INVENTIONS, PATENT APPLICATIONS, AND/OR LICENSES

Have inventions, patent applications and/or licenses resulted from the award during the reporting period? No

If yes, has this information been previously provided to the PHS or to the official responsible for patent matters at the grantee organization? No

C.5 OTHER PRODUCTS AND RESOURCE SHARING

Nothing to report

D. OVERALL PARTICIPANTS

D.1 WHAT INDIVIDUALS HAVE WORKED ON THE PROJECT?

Commons ID	S/K	Name	Degree(s)	Role	Cal	Aca	Sum	Foreign Org	Country	SS
eRA Commons User Name	Y	Sherwood, Chester	BA,MA,PHD	PD/PI	EFFORT					NA
	N	PREUSS, TODD M	PHD,BA,MOTH	Co-Investigator						NA
	N	Stimpson, Cheryl		Technician						NA
	N	HOPKINS, WILLIAM D	BA,MA,PHD	Co-Investigator						NA
	N	Cree, Mary Ann		Technician						NA

Glossary of acronyms:
S/K - Senior/Key
DOB - Date of Birth
Cal - Person Months (Calendar)
Aca - Person Months (Academic)
Sum - Person Months (Summer)
Foreign Org - Foreign Organization Affiliation
SS - Supplement Support
RE - Reentry Supplement
DI - Diversity Supplement
OT - Other
NA - Not Applicable

D.2 PERSONNEL UPDATES

D.2.a Level of Effort

Will there be, in the next budget period, either (1) a reduction of 25% or more in the level of effort from what was approved by the agency for the PD/PI(s) or other senior/key personnel designated in the Notice of Award, or (2) a reduction in the level of effort below the minimum amount of effort required by the Notice of Award?

No

D.2.b New Senior/Key Personnel

Are there, or will there be, new senior/key personnel?

No

D.2.c Changes in Other Support

Has there been a change in the active other support of senior/key personnel since the last reporting period?

No

D.2.d New Other Significant Contributors

Are there, or will there be, new other significant contributors?

No

D.2.e Multi-PI (MPI) Leadership Plan

Will there be a change in the MPI Leadership Plan for the next budget period?

No

E. OVERALL IMPACT

E.1 WHAT IS THE IMPACT ON THE DEVELOPMENT OF HUMAN RESOURCES? Not Applicable
E.2 WHAT IS THE IMPACT ON PHYSICAL, INSTITUTIONAL, OR INFORMATION RESOURCES THAT FORM INFRASTRUCTURE? NOTHING TO REPORT
E.3 WHAT IS THE IMPACT ON TECHNOLOGY TRANSFER? Not Applicable
E.4 WHAT DOLLAR AMOUNT OF THE AWARD'S BUDGET IS BEING SPENT IN FOREIGN COUNTRY(IES)? NOTHING TO REPORT

F. OVERALL CHANGES

F.1 CHANGES IN APPROACH AND REASONS FOR CHANGE

Not Applicable

F.2 ACTUAL OR ANTICIPATED CHALLENGES OR DELAYS AND ACTIONS OR PLANS TO RESOLVE THEM

NOTHING TO REPORT

F.3 SIGNIFICANT CHANGES TO HUMAN SUBJECTS, VERTEBRATE ANIMALS, BIOHAZARDS, AND/OR SELECT AGENTS

F.3.a Human Subjects

No Change

F.3.b Vertebrate Animals

No Change

F.3.c Biohazards

No Change

F.3.d Select Agents

No Change

G. OVERALL SPECIAL REPORTING REQUIREMENTS

G.1 SPECIAL NOTICE OF AWARD TERMS AND FUNDING OPPORTUNITIES ANNOUNCEMENT REPORTING REQUIREMENTS

NOTHING TO REPORT

G.2 RESPONSIBLE CONDUCT OF RESEARCH

Not Applicable

G.3 MENTOR'S REPORT OR SPONSOR COMMENTS

Not Applicable

G.4 HUMAN SUBJECTS

G.4.a Does the project involve human subjects?

No

G.4.b Inclusion Enrollment Data

Not Applicable

G.4.c ClinicalTrials.gov

Does this project include one or more applicable clinical trials that must be registered in ClinicalTrials.gov under FDAAA?

G.5 HUMAN SUBJECTS EDUCATION REQUIREMENT

Are there personnel on this project who are newly involved in the design or conduct of human subjects research?

G.6 HUMAN EMBRYONIC STEM CELLS (HESCS)

Does this project involve human embryonic stem cells (only hESC lines listed as approved in the NIH Registry may be used in NIH funded research)?

No

G.7 VERTEBRATE ANIMALS

Does this project involve vertebrate animals?

No

G.8 PROJECT/PERFORMANCE SITES

Organization Name:	DUNS	Congressional District	Address
Primary: The George Washington University	043990498	DC-001	2110 G Street, NW Washington DC 200520000
Emory University	066469933	GA-005	1599 Clifton Road NE, 4th Floor Atlanta GA 303220000
The Georgia State University	837322494	GA-005	PO BOX 3999 Atlanta GA 303023999
GEORGE WASHINGTON UNIVERSITY	043990498		OFFICE OF THE VICE PRESIDENT FOR RESEARCH 2121 EYE ST NW, STE 601

			WASHINGTON DC 200520001
The George Washington University	043990498	DC-001	2110 G Street, NW Washington DC 200520000
Emory University	066469933	GA-005	1599 Clifton Road NE, 4th Floor Atlanta GA 303220000
The Georgia State University	837322494	GA-005	PO BOX 3999 Atlanta GA 303023999
GEORGE WASHINGTON UNIVERSITY	043990498		GEORGE WASHINGTON UNIVERSITY OFFICE OF THE VICE PRESIDENT FOR RESEARCH WASHINGTON DC 200520001
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The George Washington University	043990498	DC-001	2110 G Street, NW Washington DC 200520000
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The Georgia State University	837322494	GA-005	PO BOX 3999 Atlanta GA 303023999

G.9 FOREIGN COMPONENT

No foreign component

G.10 ESTIMATED UNOBLIGATED BALANCE

G.10.a Is it anticipated that an estimated unobligated balance (including prior year carryover) will be greater than 25% of the current year's total approved budget?

Yes

Estimated unobligated balance: 150000

G.10.b Provide an explanation for unobligated balance:
Part of the costs of this project for personnel, fringe, and supplies are being paid from a James McDonnell Scholar award that ends in 2019.

G.10.c If authorized to carryover the balance, provide a general description of how it is anticipated that the funds will be spent
Carryover will be spent on additional personnel to assist with the image montage acquisition for the digital chimpanzee brain histology collection.

G.11 PROGRAM INCOME

Is program income anticipated during the next budget period?

No

G.12 F&A COSTS

Not Applicable

QVR *NIH Business System (NBS) Accounting Details*

PRINT DOWNLOAD CLOSE

PI: SHERWOOD, CHESTER FY: 2017

Total IMPACII Award Amt: $236,776

Obligation Details for Project:

5R24NS092988-03

External Organization:

GEORGE WASHINGTON UNIVERSITY

Accounting System Totals

PMS Account Type: Subaccount:domestic(P)

Award Document Number: RNS092988A *Click hyperlink for accounting details for all projects with this document number*

TIMING INFORMATION: QVR gathers disbursement data from NBS/nVision on a nightly basis, however, PMS data in NBS may lag as much as 2 weeks.

Accounting System

IC	CAN	Budget FY	Obligated Dt	Last Disburse. Dt	NBS Obligated $	NBS Disbursed $	Obligated Balance
NS	8472430	2017	2017-07-03	2019-07-11	$ 236,776.00	$ 218,265.41	$ 18,510.59

Accounting System Transactions

Accounting System Transactions

IC	CAN	OCC	NBS Doc Num	NBS Transact. Dt	Obligation Amt	Disbursement Amt
NS	8472430	414E	380RNS092988A	2019-07-11	$ 0.00	$ 25,821.88
NS	8472430	414E	380RNS092988A	2019-05-01	$ 0.00	$ 50,292.53
NS	8472430	414E	380RNS092988A	2019-02-04	$ 0.00	$ 69,685.13
NS	8472430	414E	380RNS092988A	2018-10-19	$ 0.00	$ 45,055.96
NS	8472430	414E	380RNS092988A	2018-08-01	$ 0.00	$ 27,409.91
NS	8472430	414E	380RNS092988A*10001	2017-07-03	$ 236,776.00	$ 0.00
				Grand Totals:	$ 236,776.00	$ 218,265.41

QVR *NIH Business System (NBS) Accounting Details*

PRINT DOWNLOAD CLOSE

PI: SHERWOOD, CHESTER FY: 2018

Total IMPACII Award Amt: $234,260

Obligation Details for Project:

5R24NS092988-04

External Organization:

GEORGE WASHINGTON UNIVERSITY

Accounting System Totals

PMS Account Type: Subaccount:domestic(P)

Award Document Number: RNS092988A *Click hyperlink for accounting details for all projects with this document number*

TIMING INFORMATION: QVR gathers disbursement data from NBS/nVision on a nightly basis, however, PMS data in NBS may lag as much as 2 weeks.

Accounting System

IC	CAN	Budget FY	Obligated Dt	Last Disburse. Dt	NBS Obligated $	NBS Disbursed $	Obligated Balance
NS	8472430	2018	2018-07-20		$ 234,260.00	$ 0.00	$ 234,260.00

Accounting System Transactions

Accounting System Transactions

IC	CAN	OCC	NBS Doc Num	NBS Transact. Dt	Obligation Amt	Disbursement Amt
NS	8472430	414E	380RNS092988A*10001	2018-07-20	$ 234,260.00	$ 0.00
				Grand Totals:	$ 234,260.00	$ 0.00